SCD Probiotics®

Case Study Summary – Effects of SCD Bio Ag® on soil microbial activity, biomass and enzymatic activity in field study
Agriculture – Field application (CSS-012-2016)

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Industry: Agriculture
Application: Soil amendment with SCD Bio Ag®
Where: Chariton County, Missouri
When: September 2013 – June 2014
Product: SCD Bio Ag
Customer: For research purposes, not related to any customer

Background

Soil amendment with probiotics (SCD Bio Ag) was conducted to an empty field planted with corn and soybean prior to 2012. Treatment showed increasing trends in the values of soil fungal communities, rhizobia, dehydrogenase, b-glucosaminidase and fluorescein diacetate hydrolase with the 120 L probiotic ha-1 year-1 dose implies that probiotics can be used to improve soil quality indicators.

Introduction

Intensive use of agro-chemicals over the past few decades has resulted in negative impacts on the environment and soil microbial diversity. Use of alternative management such as probiotics is believed to promote soil microbial diversity and enzymatic activity. To combat the detrimental effects that agro-chemicals have on soil microbial diversity, the Natural Resources Conservation Service Soil Health Farm agreed to participate in a study that would test the effects of the probiotic solution SCD Bio Ag on their farm. Soil testing was then conducted to see the effects on soil when using the probiotic solution, SCD Bio Ag.

Rhizobia are soil bacteria that fix nitrogen after becoming established inside root nodules of legumes. The contribution of nitrogen through fertilizers causes harsh ecological concerns, making the presence of Rhizobia in soil a vital objective.

Microbial biomass (bacteria and fungi) is a measure of the mass of the living component of soil organic matter. The microbial biomass in the decomposed plant, animal residue, and soil organic matter released lower levels carbon dioxide and enhanced plant-available nutrients.

Soil enzymes increase the reaction rate at which plant residues decompose and release plant available nutrients. The enzymes such as hydrolase and glucosidase facilitate the breakdown of organic matter.

The objective of the study was to evaluate the role of SCD Bio Ag in promoting soil quality by evaluating its effects on soil microbial biomass, microbial community structure, and soil enzymatic activities.

Methodology

Soils in the study site are classified as Armstrong loam and it included twelve 3 m x 8 m plots with four treatments in randomized block design. Split applications of probiotics were applied September 2013 and May 2014. The treatments included a non-treated control (2400 mL/ha), treatment #1 (Trt 1; 144 mL/ha probiotic solution with 2256 mL/ha of water), treatment #2 (Trt 2; 216 mL/ha probiotic solution with 2184 mL/ha of water), and treatment #3 (Trt 3; 288 mL/ha of probiotic solution with 2112 mL/ha water). The application of SCD Bio Ag was based on 0, 60, 90 and 120 L/ha per year rates. After applications, soil microbial biomass, and community structures were analyzed using phospholipid fatty acid analysis. Standard soil enzyme assays were used to assess microbial activity.

Results

After examining the results, significant differences were observed for total fungi and saprophytic fungi biomass. The Rhizobia levels in the soil bacteria in treatment #3 (Trt3) showed a tremendous increase during the study after the first split application on September 2013 (Trt3: 98.05 ng g-1 and Control: 18.72 ng g-1) (Fig. 1). Protozoa were higher in Trt3 (81 ng g-1) than control (36.61 ng g-1) in June. The significant differences were observed on soil enzymatic activity as β-glucosidase (5.19 µg), and FDA hydrolase (8270 µg) activities were higher in Trt3 than the control (respectively 4.63 µg and 5137 µg). Total microbial biomass had a strong positive correlation with total fungi, saprophytic fungi, rhizobia and protozoa biomass in Trt3. There was also a 20% increase in fungi to bacteria ratio from September 2013 to June 2014 in Trt3. Trt3 contained the highest amount of SCD Bio Ag in the mixture, suggesting a direct correlation between the increase of soil quality and SCD Bio Ag's live microorganisms.

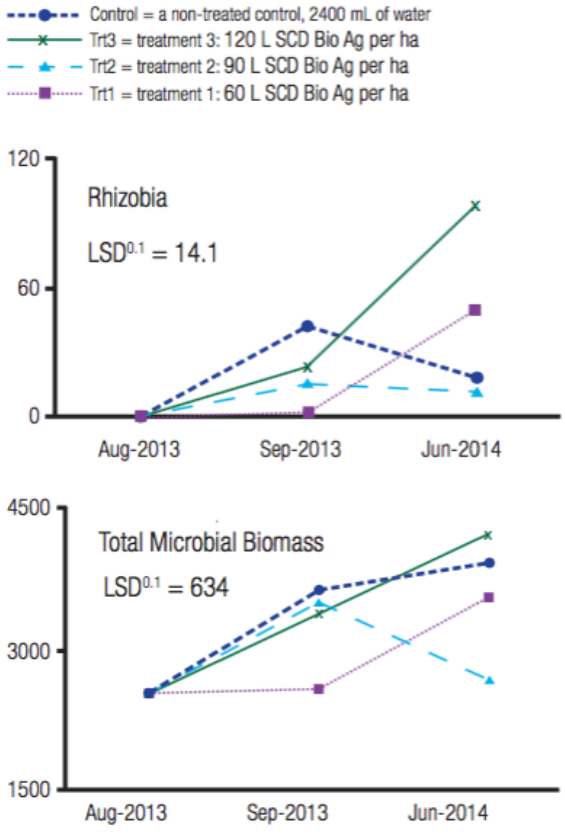

Fig. 1: Rhizobia and total microbial biomass (ng g-1) before the application of SCD Bio Ag (August 2013), after the first split application of SCD Bio Ag (September 2013), and after the second split application of SCD Bio Ag (June 2014).

Conclusions

Field study results suggest that the concentration of probiotic (Trt3; 120 L ha-1 year-1) positively affected soil fungal communities including both AMF and saprophytic fungi. Results also indicated a strong positive correlation of DHA and FDA hydrolytic activity with all and various microbial groups, respectively. Strong positive correlations were also found between b-glucosaminidase and all microbial groups.

More soil biological parameters can be included in future studies to further quantify the effects of probiotics on other soil biological parameters such as microbial biomass C, selected enzyme assays, and other soil quality indicators that may be more responsive to effects of probiotics.